UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/851,210	05/07/2001	Steven J. Harrington	D/98258	3224

7590 12/01/2004

Patent Documentation Center
Xerox Corporation
Xerox Square 20th Floor
100 Clinton Ave. S.
Rochester, NY 14644

EXAMINER	
THOMPSON, JAMES A	

ART UNIT	PAPER NUMBER
2624	

DATE MAILED: 12/01/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/851,210	HARRINGTON, STEVEN J.	
	Examiner	Art Unit	
	James A Thompson	2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 May 2001*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-16* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-16* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *07 May 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claim 1 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Claim 1 is rejected 35 U.S.C. 112, first paragraph, due to the undue breadth of the language of claim 1. Claim 1 recites a single step for obtaining a particular result. Specifically, claim 1 recites "tessellating the available color space as defined by the redundant color inks into regions where the regions are arranged so as to minimize the range of luminance variation found within the regions." Claim 1 does not recite any steps regarding how the range of luminance variations within said regions are minimized. The language of claim 1 would cover every conceivable step or group of step for achieving this stated purpose, whereas the specification only discloses at most what steps are known to the inventor. Applicant is further directed to MPEP §2164.08(a).

3. Claim 8 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Claim 8 is rejected 35 U.S.C. 112, first paragraph, due to the undue breadth of the language of claim 8. Claim 8 recites a single step for obtaining a particular result. Specifically, claim 8 recites "tessellating the color space so as to minimize luminance variation in the redundant color inks utilized." Claim 8 does not recite any steps regarding how the range of luminance variations within said regions are minimized. The language of claim 8 would cover every conceivable step or group of step for achieving this stated purpose, whereas the specification only discloses at most what steps are known to the inventor. Applicant is further directed to MPEP §2164.08(a).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 1-3 and 5-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kasson (US Patent 5,390,035) in view of Gondek (US Patent 5,982,990).

Note: Since there are some repeating dependent claims, all of the independent claims are discussed first. Discussions of the dependent claims follow after all of the discussions of the independent claims.

Regarding claim 1: Kasson discloses tessellating the available color space (figure 1, figure 7 and figure 13 of Kasson) as defined by the color inks (column 10, lines 59-63 and column 17, lines 35-45 of Kasson). Since the regions are arranged in a compact packing form (figure 2 and column 11, lines 28-35 of Kasson), said regions are therefore arranged so as to minimize the range of luminance variation found within the regions. A close-packing format packs the tetrahedra efficiently (column 11, lines 48-53 of Kasson), thus minimizing the variations in each dimension (column 14, lines 3-9 of Kasson), which would result in minimizing the range of luminance variation. Kasson further discloses that the method can be applicable in general to m-dimensional color output spaces (column 17, lines 55-58 of Kasson), and therefore an integer, m, color inks.

Kasson does not disclose expressly that said color space is defined by redundant color inks.

Gondek discloses partitioning a color space (figure 3 of Gondek) into a plurality of regions, wherein said color space is defined by redundant color inks (column 4, lines 58-65 of Gondek). The color space is divided with a distinct transition between the light redundant colors and the dark redundant colors (column 6, lines 7-12 of Gondek) by using exclusively the light color ink or the dark color ink for particular color values ranges (column 6, line 66 to column 7, line 7 of Gondek). Further, by incrementally establishing control points for color

transitions (column 7, lines 40-46 of Gondek), the color space partitioning minimizes the range of luminance variation.

Kasson and Gondek are combinable because they are from the same field of endeavor, namely digital image color space processing. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to tessellate the color space, as taught by Kasson, using a color space with redundant colors, as taught by Gondek. The motivation for doing so would have been to image the overall quality of the printed image by using low-dye inks (column 6, lines 7-12 of Gondek). Therefore, it would have been obvious to combine Gondek with Kasson to obtain the invention as specified in claim 1.

Regarding claim 8: Kasson discloses tessellating the color space (figure 1, figure 7 and figure 13 of Kasson) of the color inks that are utilized (column 10, lines 59-63 and column 17, lines 35-45 of Kasson). Since the regions are arranged in a compact packing form (figure 2 and column 11, lines 28-35 of Kasson), said regions are therefore arranged so as to minimize the luminance variation found within the regions. A close-packing format packs the tetrahedra efficiently (column 11, lines 48-53 of Kasson), thus minimizing the variations in each dimension (column 14, lines 3-9 of Kasson), which would result in minimizing the luminance variation. Kasson further discloses that the method can be applicable in general to m-dimensional color output spaces (column 17, lines 55-58 of Kasson), and therefore an integer, m, color inks.

Kasson does not disclose expressly that said color space is defined by redundant color inks.

Gondek discloses partitioning a color space (figure 3 of Gondek) into a plurality of regions, wherein said color space is

defined by redundant color inks (column 4, lines 58-65 of Gondek). The color space is divided with a distinct transition between the light redundant colors and the dark redundant colors (column 6, lines 7-12 of Gondek) by using exclusively the light color ink or the dark color ink for particular color values ranges (column 6, line 66 to column 7, line 7 of Gondek). Further, by incrementally establishing control points for color transitions (column 7, lines 40-46 of Gondek), the color space partitioning minimizes the range of luminance variation.

Kasson and Gondek are combinable because they are from the same field of endeavor, namely digital image color space processing. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to tessellate the color space, as taught by Kasson, using a color space with redundant colors, as taught by Gondek. The motivation for doing so would have been to image the overall quality of the printed image by using low-dye inks (column 6, lines 7-12 of Gondek). Therefore, it would have been obvious to combine Gondek with Kasson to obtain the invention as specified in claim 8.

Regarding claim 13: The arguments regarding claim 8 are incorporated herein. Kasson discloses dividing a function domain using rectangular volumes over the entire function domain (figure 1 and column 11, lines 9-19 of Kasson). The rectangles are then packed with tetrahedrons (column 11, lines 48-55 of Kasson) incrementally throughout the function space (figure 10 and column 17, lines 61-67 of Kasson). The output in each plane of the function space corresponds to a color ink (column 17, lines 41-45 of Kasson). Therefore, the system of Kasson operates by connecting the color inks (column 17, lines 41-45 of Kasson) in a sorted order across the color space (figure 10 and

column 17, lines 61-67 of Kasson) so as to create tetrahedral non-overlapping tessellated regions (figure 1 and column 11, lines 9-19 and lines 48-55 of Kasson). Further, as shown in figure 1 of Kasson, the function values, and thus the tetrahedrons, are ordered in increasing value as one traverses the Red, Green and Blue axes, and thus from the darkest luminance (black = (R=0,G=0,B=0)) to the lightest luminance (white = (R=Rmax,G=Gmax,B=Bmax)).

Kasson does not disclose expressly sorting the redundant color inks by order of luminance from the darkest to the lightest; and that said connecting occurs with the redundant color inks in the order sorted in the sorting step.

Gondek discloses sorting the redundant color inks by order of luminance from the lightest to the darkest (column 7, lines 46-49 of Gondek). However, since the conversion is based on transitions (column 7, lines 46-49 of Gondek), a sorting in the opposite order, from darkest to lightest, can also be done, as demonstrated below in the combination of Kasson and Gondek.

Kasson and Gondek are combinable because they are from the same field of endeavor, namely digital image color space processing. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to sort the redundant color inks by order of luminance, and thus connect said redundant color inks in the order sorted, as taught by Gondek, said order being from darkest to lightest, as taught by Kasson. The motivation for doing so would have been to establish transition control points for using either the light cyan and/or light magenta or the dark cyan and/or dark magenta (column 7, lines 13-17 of Gondek), thus causing less graininess in the resultant image (column 7, lines 10-15 of Gondek).

Therefore, it would have been obvious to combine Gondek with Kasson to obtain the invention as specified in claim 13.

Regarding claims 2, 11 and 14: Kasson discloses overlaying the tessellated color space result from the prior tessellating step with interpolation points so as to create an overlay lookup table (column 13, lines 14-18 and lines 36-39 of Kasson).

Regarding claims 3, 12 and 15: Kasson discloses applying image data to the overlay lookup table (column 13, lines 11-18 of Kasson) to point to which color inks to select (column 17, lines 38-45 of Kasson) and provide the amounts to use of the selected color inks (column 17, lines 45-49 of Kasson).

Kasson does not disclose expressly that said color inks are redundant color inks.

Gondek discloses using redundant color inks (column 4, lines 58-61 of Gondek).

Kasson and Gondek are combinable because they are from the same field of endeavor, namely digital image color space processing. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to use a color space with redundant colors, as taught by Gondek. The motivation for doing so would have been to image the overall quality of the printed image by using low-dye inks (column 6, lines 7-12 of Gondek). Therefore, it would have been obvious to combine Gondek with Kasson to obtain the invention as specified in claims 3, 12 and 15.

Regarding claim 5: Kasson discloses that the amounts are interpolated from the interpolation points stored in the overlay lookup table (column 14, lines 17-26 of Kasson).

Regarding claim 6: Kasson discloses that the interpolation is performed by calculating the volume of tetrahedra formed by

the interpolation points (column 15, equation 1 and lines 30-36 of Kasson).

Regarding claims 7 and 10: Kasson discloses that the regions are non-overlapping, as can clearly be seen in figure 3A and figure 7 of Kasson and as can clearly be seen in how the rectangular solid is tessellated into tetrahedrons in figure 13 of Kasson.

Regarding claim 9: Kasson discloses dividing a function domain using rectangular volumes over the entire function domain (figure 1 and column 11, lines 9-19 of Kasson). The rectangles are then packed with tetrahedrons (column 11, lines 48-55 of Kasson) incrementally throughout the function space (figure 10 and column 17, lines 61-67 of Kasson). The output in each plane of the function space corresponds to a color ink (column 17, lines 41-45 of Kasson). Therefore, the system of Kasson operates by connecting the color ink points (column 17, lines 41-45 of Kasson) in a sorted order (figure 10 and column 17, lines 61-67 of Kasson) so as to create tetrahedral tessellated regions (figure 1 and column 11, lines 9-19 and lines 48-55 of Kasson). Further, as shown in figure 1 of Kasson, the function values, and thus the tetrahedrons, are ordered in increasing value as one traverses the Red, Green and Blue axes, and thus from the darkest luminance (black = (R=0,G=0,B=0)) to the lightest luminance (white = (R=Rmax,G=Gmax,B=Bmax)).

Kasson does not disclose expressly sorting the redundant color inks by order of luminance from the darkest to the lightest; adding the redundant color inks as points to the color space; and that said connecting occurs with the redundant color inks in the order sorted in the sorting step.

Gondek discloses sorting the redundant color inks by order of luminance from the lightest to the darkest (column 7, lines 46-49 of Gondek). However, since the conversion is based on transitions (column 7, lines 46-49 of Gondek), a sorting in the opposite order, from darkest to lightest, can also be done, as demonstrated below in the combination of Kasson and Gondek.

Gondek further discloses adding the redundant color inks as points to the color space (column 7, lines 26-30 of Gondek).

Kasson and Gondek are combinable because they are from the same field of endeavor, namely digital image color space processing. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to sort the redundant color inks by order of luminance, and thus connect said redundant color inks in the order sorted, as taught by Gondek, said order being from darkest to lightest, as taught by Kasson. The motivation for doing so would have been to establish transition control points for using either the light cyan and/or light magenta or the dark cyan and/or dark magenta (column 7, lines 13-17 of Gondek), thus causing less graininess in the resultant image (column 7, lines 10-15 of Gondek). Therefore, it would have been obvious to combine Gondek with Kasson to obtain the invention as specified in claim 9.

Regarding claim 16: Kasson discloses that, if creating a tetrahedral non-overlapping tessellated region results in a concave shape, then additional tetrahedral non-overlapping tessellated regions are added to fill the cavity and maintain a convex construction (figure 7 and column 14, lines 3-9 of Kasson). The tetrahedra are generated using a volume packing technique which minimizes distortion of the domain space (column 14, lines 3-6 of Kasson). Figure 7 of Kasson shows that an

overall convex shape is maintained for the domain space. Further, since the domain space is packed with octahedra that are in turn packed with tetrahedra (column 14, lines 6-9 of Kasson), then a convex shape will inherently be maintained owing to the convex shape of an octahedron.

6. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kasson (US Patent 5,390,035) in view of Gondek (US Patent 5,982,990) and Spaulding (US Patent 5,553,199).

Regarding claim 4: Kasson in view of Gondek does not disclose expressly that the regions are arranged so that region boundaries are predominately orthogonal to the axis of luminance.

Spaulding discloses tetrahedral regions (figure 3; figure 9; and column 5, lines 36-44 of Spaulding) that are arranged so that region boundaries are predominately orthogonal to the axis of luminance, as can clearly be seen in figure 5 of Spaulding.

Kasson in view of Gondek is combinable with Spaulding because they are from the same field of endeavor, namely digital image color space processing. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to arrange the regions taught by Kasson so that they are predominately orthogonal to the axis of luminance, as taught by Spaulding. The motivation for doing so would have been to map the color gamut of the printer (column 7, lines 19-25 of Spaulding) so that a solution to problem of how to combine the ink colorants to produce a desired color can be found (column 3, lines 2-11 of Spaulding). Therefore, it would have been obvious to combine Spaulding with Kasson in view of Gondek to obtain the invention as specified in claim 4.

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Sakamoto et al., US Patent 4,275,413, 23 June 1981. This patent also teaches tessellating a color space into non-overlapping tetrahedra and interpolating color space values for color correction.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to James A Thompson whose telephone number is 703-305-6329. The examiner can normally be reached on 8:30AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David K Moore can be reached on 703-308-7452. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

James A. Thompson
Examiner
Art Unit 2624

JAT
23 November 2004

THOMAS D. LEE
PRIMARY EXAMINER